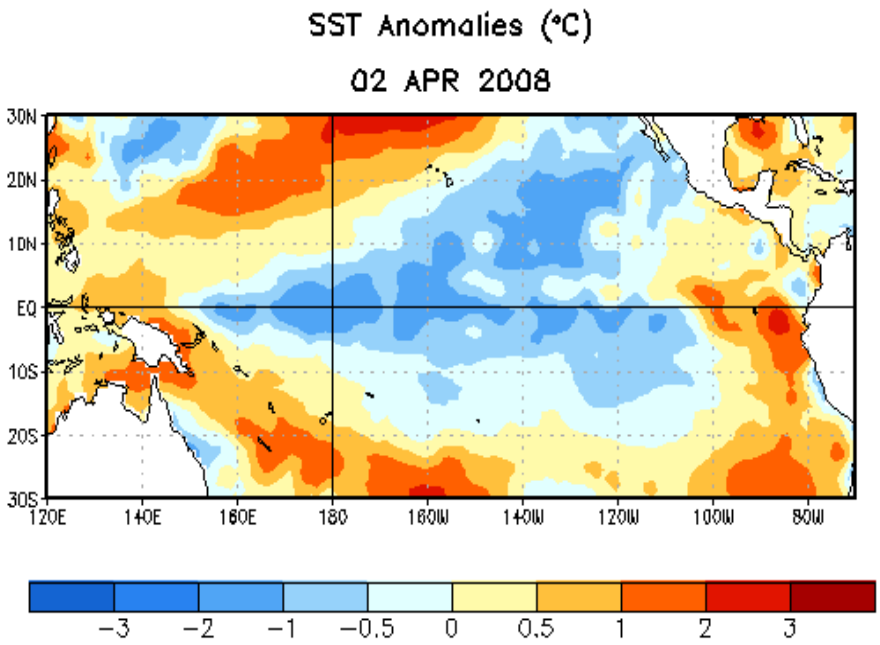
Northern Rockies Weather Watch
NWS Missoula, Montana
Spring 2008

La Niña: What does it mean and what are the potential impacts?

La Niña was the hot topic over the past winter season, but what does it mean for the Northern Rockies and how much longer will it last?

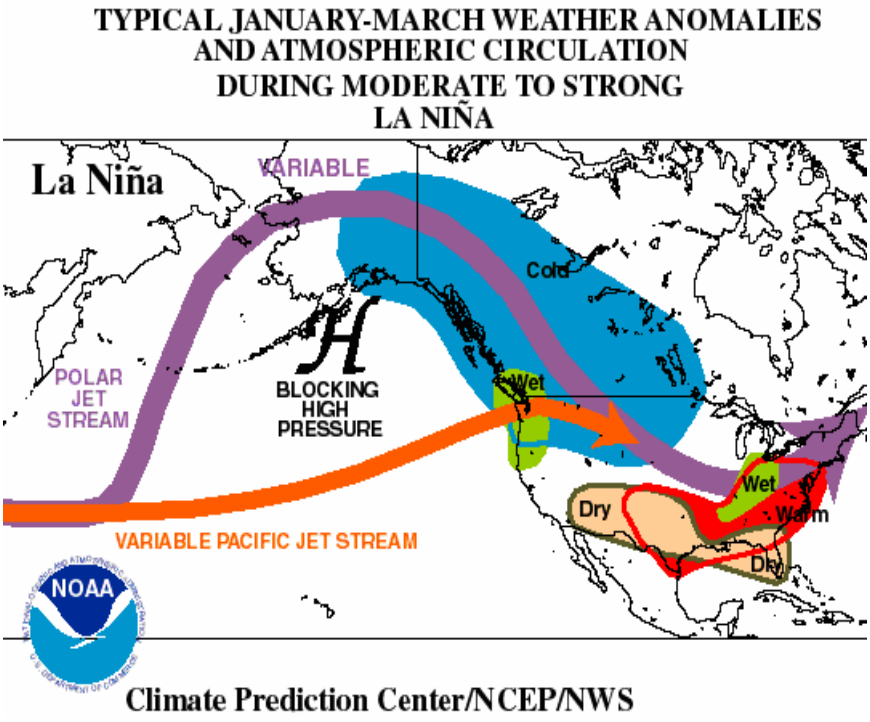
La Niña refers to the periodic cooling of ocean surface temperatures in the central and east-central equatorial Pacific. La Niña occurs approximately every 3 to 5 years and represents the cool phase of the El Niño/ Southern Oscillation (ENSO) cycle. By the end of January 2008, equatorial sea surface temperature anomalies were more than 2.0℃ (3.6℉) below average across parts of the central and east-central equatorial Pacific. One way experts determine the strength of a La Niña event is to examine these sea surface temperature anomalies, which represent the difference between the current sea surface temperatures and the normal sea surface temperatures for that time of year. An anomaly of 2.0℃ is quite large, representing the strength of this La Niña event.

Experts are not expecting an end anytime soon, with most indicating a moderate La Niña continuing through May-June-July. Although the strength of sea surface temperature anomalies has weakened since January, the atmosphere remains in a pattern reminiscent of a strong La Nina. Often times, La Niña becomes difficult to predict in the spring and summer months as sea surface temperatures tend to peak in this time frame along the equator, and mask La Niña effects.



Sea surface temperature anomalies centered on April 2nd, 2008.
Notice the cooler than normal temperatures extending westward along the equator.
This is a typical signature of La Niña conditions.

During a typical La Niña episode, the normal patterns of tropical precipitation and atmospheric circulation become disrupted. The abnormally cold waters in the eastern Pacific along the equator give rise to suppressed cloudiness and rainfall in that region, especially during the Northern Hemisphere winter and spring seasons. At the same time, rainfall is enhanced over Indonesia, Malaysia and northern Australia. This major shift in precipitation patterns has global implications on both temperature and precipitation on the seasonal scale. Potential La Niña impacts during January-March include above-average precipitation in the Northern Rockies, the Pacific Northwest, and the Ohio and Tennessee Valleys.

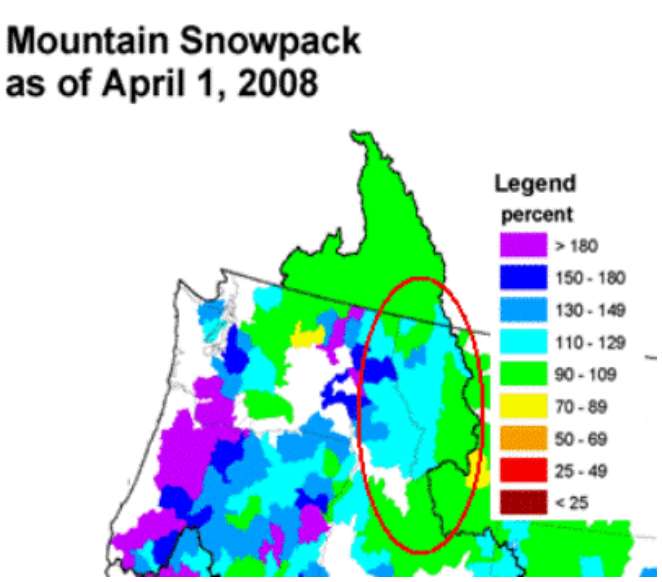


This figure shows the typical atmospheric conditions and impacts to North America during the La Niña portion of the ENSO cycle in the winter and spring months. Typically, a strong jet stream will feed moist and energetic flow into the Pacific Northwest while cold air is able to slip down the back side of a high pressure ridge that commonly forms over the Gulf of Alaska.

La Niña may have been at least partially responsible for the below normal temperatures that were experienced during March and April across the Northern Rockies this year. Although cool and wet conditions are typical of La Niña during winter and spring, strong La Niñas of the past have been associated with hot and dry conditions during the summer months in this area. With some uncertainty remaining in the La Niña forecast for this summer, particularly regarding the strength, the longer term forecast carries less confidence. Nevertheless, evidence supports warmer and drier than normal conditions for this summer.

Current Snow Pack and Potential Flooding

April showers bring May flowers…and possible flooding! A cool and moist spring (thanks to La Niña) has built up a respectable snow pack across much of the Northern Rockies. Due to the unusually cool spring temperatures inhibiting melting thus far, snow pack is particularly high in the mid elevations, and in some instances 200% of normal! Add in the upper elevations, which are running about average, and you have quite a bit of potential run-off once temperatures begin to climb. The image to the left displays the snowpack as of April 1st, compared to normal for this time of year. Notice that most of the Northern Rockies is displayed in light blues and greens, representing snow pack running about 90-130% above normal! Run-off could lead to flooding, depending upon how fast the region warms up as well as the timing and intensity of precipitation events experienced through the rest of spring. Current stream flow forecasts call for the rivers of Western Montana and North Central Idaho to run at or above average later this season, with the Bitterroot River having the highest potential for flooding issues. Below is a table listing some of the river locations most in danger of approaching, or even exceeding, flood stage levels.

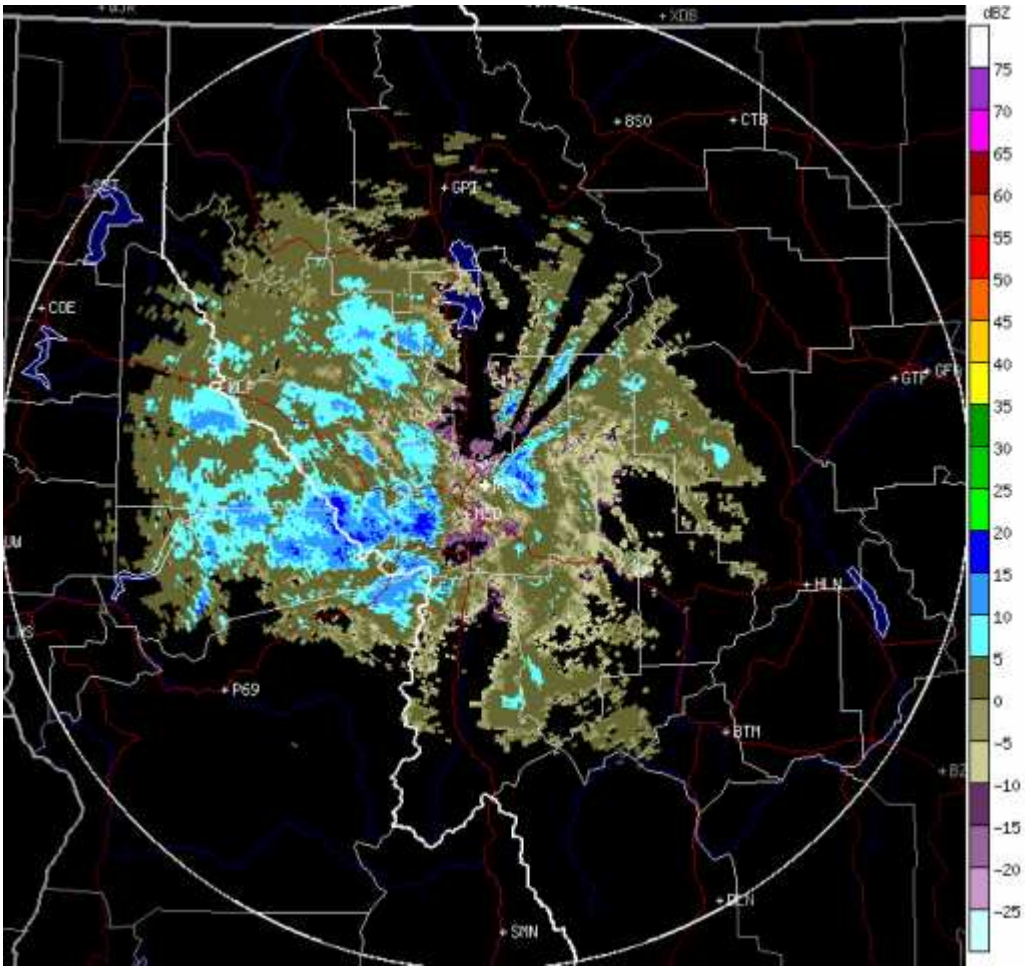


River	Forecasted Peak Stream Flow Range	Flood Stage
Bitterroot near Missoula	**9.5 – 12.1 ft**	**11 ft**
Bitterroot near Darby	**6.6 – 8.1 ft**	**7.5 ft**
Clark Fork above Missoula	**8.4 – 11.3 ft**	**10 ft**
Middle Fork of the Flathead near West Glacier	**8.1 – 11.7 ft**	**10 ft**
North Fork of the Flathead near Columbia Falls	9.0 – 12.7 ft	13 ft
Flathead at Columbia Falls	**12.0 – 14.1 ft**	**14 ft**
St. Regis near St. Regis	6.5 – 7.4 ft	8 ft
Fisher near Libby	**5.8 – 7.8 ft**	**7.5 ft**
Yaak near Troy	**7.6 – 9.4 ft**	**8 ft**
Selway near Lowell	**12.7 – 15.4 ft**	**14 ft**
Clearwater at Orofino	15.1 – 16.9 ft	17 ft

With this flood potential, all spotters (especially our designated flood watchers) are urged to keep an eye on their local rivers, as levels could rise quite quickly in the coming months. The Missoula weather office is particularly interested in your reports of any small stream rises and flooding, especially in the case that damage is being caused. This will give us greater lead time in issuing flood statements for the larger rivers as well as alert us to flooding issues we may not realize are occurring. With your help and dedication, we hope to make this a safe run-off season!

Heavy December Snow in Northwest Montana

The month of December was ushered in by a powerful winter storm that hit the entire Pacific Northwest, including the Northern Rockies. Massive flooding and mudslides in portions of Oregon and Washington gave way to heavy snow, particularly across northwest Montana and north-central Idaho. Final snowfall totals of a foot or more were not uncommon over a 36 hour period spanning December 1st and 2nd. A few locations measured greater than 2 feet of snow! In addition, strong winds accompanied the system, pounding much of the Northern Rockies with wind gusts between 40 and 50 mph. These winds aggravated the situation in the Grangeville area in Idaho, stirring up snow and causing a period of blizzard conditions on the Camas Prairie.



Radar image on the morning of December 2nd. Notice the widespread precipitation evident across the Idaho panhandle and northwest Montana.

So what exactly was to blame for all this snow? The culprit was a warm front that moved through the region the evening of the 1st into the morning of the 2nd. The front provided sufficient lift and moisture to support the development of moderate to heavy snowfall. The front stalled as it moved across northwest Montana and north-central Idaho, keeping the focus for snow over this area for quite some time. From Missoula southward, rain fell in the valleys due to warmer air at the surface. However, in northwest Montana and north central Idaho, a bubble of cold air remained trapped at the surface, allowing heavy snow to fall all the way down to even the lowest valley locations. In fact, valley locations across portions of northwest Montana received as much as 2 to 3 feet during this time frame! Below is a brief summary of the snow amounts reported across western Montana and north central Idaho.

Location	Elevation	Snowfall
Pierce, ID	3185’	5”
Headquarters, ID	3165’	8”
Dixie. ID	5620’	13”
Lolo Pass, ID	5239’	20”
Olney, MT	3165’	12”
Yaak, MT	3075’	21-28”
Eureaka, MT	2800’	4”
Libby, MT	2070’	16-18”
Troy, MT	1950’	30-36”
1 N Polebridge, MT	3540’	16”
West Glacier to Essex, MT	3200’	12-14”
Lookout Pass, MT	5121’	33”

Location	Elevation	Peak Wind (mph)
1 N Grangeville, ID	3310’	S 34G54
Slate Creek, ID	1568’	SW 20G56
Salmon, ID	5100’	SW 24G38
Eureka (Airport), MT	2668’	SE23G32
Kalispell (Airport), MT	2972’	S 21G31
Lookout Pass, MT	4725’	SE 16G52
Missoula (Airport), MT	3189’	S 25G36
Sula, MT	4570’	SE 11G25
McDonald Pass, MT	6325’	W 33G43
Avon, MT	5085’	S 34G42

Dear Weather Spotter:

The National Weather Service in Missoula is still looking to enhance its weather spotter network by a volunteer program: The Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS). In addition to current duties of being a weather spotter, we would like you to consider volunteering for this great program to assist us in the accomplishment of our mission, which is to protect lives and property by issuing accurate and timely weather forecasts and warnings.

The CoCoRaHS program is a unique, non-profit, community-based, high-density network of volunteers who take daily measurements of rain, hail, and snow in their backyards and record the information onto the CoCoRaHS website. Observations are immediately available to view in map and table form for the National Weather Service, media and the public. The program was born in 1998 with a few dozen volunteers in Colorado. As more volunteers were recruited, enough data became available that rainfall maps could be produced for every passing weather system or storm. The new data uncovered fascinating local patterns that were valuable for both the National Weather Service and local residents. CoCoRaHS continues to grow and now has thousands of volunteers. The State of Montana was added to the program back in January 2007 with Northern Ag Network Weathercaster John Pulasky heading the program with support from the National Weather Service offices across Montana. The state of Idaho will hopefully be added in 2009. We encourage you to first read more information about this program at www.cocorahs.org before making a decision on whether or not to volunteer. Training sessions for CoCoRaHS are scheduled across Montana and can be found at www.cocorahs.org by clicking on the state of Montana.

If you are interested in volunteering for this program or have questions, you can email me at trent.smith@noaa.gov or call 406-329-4840 and ask for Trent, Bryan or Peter.

Sincerely,

Trent Smith
CoCoRaHS Focal Point
National Weather Service
Missoula, MT

Spotter Quiz

Match the following words with the correct definition:

1. Updraft
2. Tornado
3. Graupel
4. Hail
5. Downburst
6. Severe thunderstorm warning
7. Lightning
8. Jet stream
9. Funnel cloud
10. Wall cloud
11. Severe thunderstorm watch

A. Heavily rimed snow particles; diameter smaller than 5 mm.
B. Precipitation in the form of balls or irregular lumps of ice, always produced by convective clouds. Diameter must be greater than 5 mm.
C. A local, often abrupt lowering from a cumulonimbus cloud base into a low-hanging accessory cloud.
D. A violently rotating column of air, extending from a cumulus cloud and in contact with the ground.
E. A condensation cloud, typically funnel-shaped and extending outward from a cumuliform cloud, associated with a rotating column of air that is not in contact with the ground.
F. Severe weather is imminent or occurring.
G. Conditions are favorable for severe weather, but are not currently occurring.
H. A transient, high-current electric discharge with path lengths measured in kilometers.
I. Small-scale upward moving air current in a cumulonimbus cloud.
J. Relatively strong winds concentrated within a narrow stream in the atmosphere.
K. An area of strong, often damaging winds produced by a convective downdraft over an area from less than 1 to 10 km in horizontal dimensions.

Answers: 1. I, 2. D, 3. A, 4. B, 5. K, 6. F, 7. H, 8. J, 9. E, 10. C, 11. G

Now is the time to Schedule your Spring/Summer Spotter Training sessions. Please contact either Peter Felsch or Bryan Henry by phone at:
(406) 329-4840
or by email at:
Peter.Felsch@noaa.gov or Bryan.Henry@noaa.gov

We need to hear from YOU!

1-800-676-6975
(Day or Night)

-Tornado, funnel cloud and waterspout
-Winds, estimated and measured >40 mph
-Heavy rain, > ½ inch or more per hour
-Flooding of any kind
-Hail of any size
-Visibility reduced less than ¼ mile
-Heavy snow, 1 inch or more per hour
-Freezing rain or drizzle
-Weather related damages or injuries
-Weather related road closures
-Un-forecast weather of any kind